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Dear Daryl;

I am enclosing the material I sent to Rick Collier in which I define woody vegetation types. First there is a general description of the types and then for those areas classified as oak savannah or mature hardwoods I give a more detailed description on a site by site basis. I have enclosed a vegetation map which provides a key for the site descriptions. This is an older version of the vegetation map but it was all I had available. I have drawn envelopes around sites that I have since reclassified and have indicated their current classification.

I think the issue of what these types are called and whether more types should be recognized depends on the purpose of the classification. I see the classification as being used to make decisions about Refuge development. As such the difference between say gully woods and scrub woods may not be that important. Although it is desirable to have an accurate and informative vegetation map, the vegetation map is used primarily at the beginning of the siting decision process. Very quickly it becomes necessary to have information on specific sites. A narrative on individual sites within a vegetation type, which is what I have provided, may be more informative than trying to name all the variations on a theme. At the same time I think it is important that we arrive at some consensus on the most appropriate terminology so that when we are talking about say riparian woods we are all thinking of the same thing.

I look forward to discussing this with you.

Sincerely,



John M. Pleasants

Description of Vegetation Types

Oak Savannah

Oak savannahs are characterized by scattered large spreading bur oaks. The spreading habit of these trees indicates they grew under open conditions, unimpeded by neighboring trees. Tree ring counts of some of these trees indicate they are 100-150 years old. Originally there would have been large openings between the oaks. The openings would have had herbaceous species typical of the prairie. Frequent fires would have prevented the establishment of other trees in the open spaces. Bur oak is maintained because of its drought and fire tolerance. Since settlement times fires have been suppressed. Many oak savannahs have also been grazed. This has markedly changed these communities. Where simple fire suppression has occurred the open spaces among the oaks have been invaded by many opportunistic species. Most of these have seeds that are dispersed long distances by animals or wind. Such species include hackberry, honeylocust, mulberry, elm, and cherry. Other species present include shagbark hickory, bitternut hickory, black walnut and occasionally red oak and Kentucky coffee tree. The understory is often impenetrable and includes shrubs and shrub/trees such as raspberry and hawthorn. Where grazing has occurred the canopy species associated with the oaks are those resistant to cattle grazing, principally thorny species such as honeylocust, hawthorn and sometimes osage orange. With grazing activity the understory is more open with thorny shrubs such as raspberry and occasionally prickly ash. Areas that were once grazed but have not been for a while have a nearly impenetrable understory of raspberry and saplings of honeylocust and hawthorn.

Mature Hardwoods

Mature hardwood forests typically have a closed canopy formed by large trees and a relatively open understory. As with most of the natural vegetation left in the Walnut Creek area, this type of forest is usually associated with ravines and streams that made it unprofitable for the early settlers to clear the land. Canopy species include some bur oak, which may become common on upland areas, shagbark hickory, some red oak, bitternut hickory, some hackberry, and in more mesic areas basswood and walnut. Ohio buckeye is occasionally found in mesic areas and in one locality is the dominant species.

Floodplain Woods

This vegetation type is relatively uncommon. It occurs adjacent to Walnut Creek proper on flat land that is occasionally flooded when the creek overflows in the spring. It has a closed canopy of primarily silver maple and some boxelder. The understory is often bare but may have large patches of stinging nettle, woodnettle and touch-me-not.

Scrub Woods

Scrub woods are found in a variety of areas that were probably cleared at one point in time. They can be found along some streams and away from streams such as along fencerows. They include mostly opportunistic species such as honeylocust, elm, cherry, hackberry, mulberry and sometimes silver maple. Trees are typically not large. The canopy is relatively open and so is the understory which is composed of weedy herbs and thorny shrubs.

Riparian Woods

This is the most common vegetation type in the Walnut Creek area. It is found along most of the feeder streams into Walnut Creek although less often along Walnut Creek itself because of its deeper bed. It often includes many of the scrub woods species but in addition has species characteristic of wetter environments such as boxelder, willow, cottonwoods, and silver maple.

Prairie

Only one native prairie was found. It is on a strip adjacent to a stream. The strip is a gentle slope at the crest of which is a fencerow and then a crop field. The prairie is not a mesic tall-grass prairie. The soil is very shallow and rocky and the plants present are typical of dry short-grass prairie. The predominant grass is rough prairie dropseed which forms an almost pure carpet. The dominant forb is pussy-toes which has a prostrate habit and is a ubiquitous ground cover. Several drainage swales exist which contain spike rush. Forbs present include purple prairie cone flower, black-eyed susan, compass plant, goldenrod and milkweed. Sumac is invading in some areas but the shallow soils prevent it from growing very large.

Prairie Plants

In a few fields adjacent to woods there are isolated prairie plants. These are typically forbs with large tap roots that have allowed the plants to survive grazing and some tillage. These forbs include (not all in the same locality) compass plant, culver's root, bush clover, wild bergamot, goldenrod, and prairie false indigo. No native prairie grasses were present; the above species are usually surrounded by brome grass.

Species List

Native Trees

Black Willow *Salix nigra*
Sandbar Willow *Salix interior*
Eastern Cottonwood *Populus deltoides*
Black Walnut *Juglans nigra*
Butternut *Juglans cinerea*
Shagbark Hickory *Carya ovata*
Bitternut Hickory *Carya cordiformis*
Bur oak *Quercus macrocarpa*
Red oak *Quercus rubra*
Slippery Elm *Ulmus rubra*
American Elm *Ulmus americana*
Hackberry *Celtis occidentalis*
Red Mulberry *Morus rubra*
Osage Orange *Maclura pomifera*
Hawthorn *Crataegus sp.*
Black Cherry *Prunus serotina*
Chokecherry *Prunus virginiana*
Kentucky Coffee Tree *Gymnocladus dioica*
Honey Locust *Gleditsia triacanthos*
Black Locust *Robinia pseudoacacia*
Silver Maple *Acer saccharinum*
Boxelder *Acer negundo*
Ohio Buckeye *Aesculus glabra*
Basswood *Tilia americana*
Green Ash *Fraxinus pennsylvanica*

Shrubs (major species)

Gray Dogwood *Cornus racemosa*
Honeysuckle *Lonicera sp.*
Black Raspberry *Rubus occidentalis*
Prickly Ash *Xanthoxylum americanum*
Gooseberry *Ribes sp.*
Smooth Sumac *Rhus typhina*

Herb Understory (selected species identifiable in summer)

White Snakeroot *Eupatorium rugosum*
Beggarticks *Bidens sp.*
Blue Lobelia *Lobelia siphilitica*
Virginia Waterleaf *Hydrophyllum virginianum*
Clearweed *Pilea pumila*
Wild Lettuce *Lactuca sp.*
Germander *Teucrium canadense*
Black snakeroot *Sanicula gregaria*
Jumpseed *Polygonum virginianum*
Knotweed *Polygonum scandens*
Ironweed *Veronia fasciculata*

Agrimony *Agrimonia gryposepala*
Giant Hyssop *Agastache foeniculum*
False Boneset *Kuhnia eupatoroides*
Cup Plant *Silphium perfoliatum*
Jack-in-the-Pulpit *Arisaema triphyllum*
Stinging Nettle *Urtica dioica*
Virginia Creeper *Parthenocissus quinquefolia*
Bellflower *Campanula americana*
Wood Nettle *Laportea canadensis*
Touch-me-not *Impatiens* sp.
May-apple *Podophyllum peltatum*
Heal-all *Prunella vulgaris*
Greenbrier *Smilax hispida*
Sweet Cicely *Osmorhiza longistylis*
Solomon's Seal *Polygonatum biflorum*
False Solomon's Seal *Smilacina racemosa*

Ferns

Lady Fern *Athyrium angustum*
Fragile Fern *Cystopteris protusa*

Prairie (species from native prairie area and from patches with isolated prairie plants)

Black-eyed Susan *Rudbeckia serotina*
Prairie False Indigo *Baptisia leucantha*
Purple Cone Flower *Echinacea purpurea*
Culver's Root *Veronicastrum virginicum*
Bush Clover *Lespedeza capitata*
Compass Plant *Silphium laciniatum*
Wild Bergamot *Monarda fistulosa*
Pussy Toes *Antennaria neglecta*
Rough Prairie Dropseed *Sporobolus asper*
Spike Rush *Eleocharis* sp.

Description by site of woody vegetation of special interest

For the Walnut Creek area I have recognized 5 woody vegetation types: oak savannah, mature hardwoods, floodplain woods, scrub woods and riparian woods. Two of these types, oak savannah and mature hardwoods, are relatively rare on the Refuge site and are of the most interest to biologists and potential visitors. The other 3 types are made up of species with widespread distribution throughout the Refuge and throughout Iowa. They are not special as vegetation units and could be considered expendable in any Refuge development plans that would impact them. They do have value as wildlife habitat however. The oak savannah and mature hardwoods occupy the southern half of the Refuge which is where historical records indicate forest vegetation was. I will discuss these two vegetation types in more detail including information on their quality. For the oak savannah habitat I will also include an appraisal of the possibilities for successful restoration. ~~The oak savannah has undergone the most change since~~ presettlement times due to fire suppression. The numbers used to designate sites correspond to numbers on the enclosed map.

Oak Savannahs

Techniques and practices for the restoration of oak savannahs have only recently begun to be developed. Much of what we know comes from the efforts of Steve Packard with The Nature Conservancy in Illinois (see Restoration and Management Notes 6(1):13-22). It is important in any restoration to know what the vegetation was like originally (i.e. presettlement). For oak savannahs this is a problem because virtually no oak savannahs exist today in a non-man-impacted form. What has been learned in Illinois is that an oak savannah is not simply a prairie with scattered oak trees. The herbaceous species in an oak savannah must be somewhat shade tolerant. Although some of the herbaceous species appear to have been prairie types, a number of the species were woodland types and still others may have bridged both woodland and prairie habitats but have been most abundant in oak savannahs. Some progress has been made in identifying species most appropriate for oak savannah restoration for Illinois. More research will be needed to determine the species complement appropriate for south central Iowa. A second important consideration in restoration is the methodology for removing unwanted species and introducing desirable species. Experimentation will be necessary to determine the best way to remove invading honeylocust trees and other scrub species and to establish oak savannah forbs and grasses.

1) High quality woods. *Western portion:* This is a mixed woods, grading from oak savannah on upland areas to hardwoods on slopes nearer the creek to the north. There are a number of large bur oaks and some large black walnuts upland. Although the open spaces in this savannah have been invaded, the invading species are of a more desirable sort; there is only a small amount of honeylocust, there are a large number of young bitternut hickory trees, some hackberry and cherry. Towards the stream on the north side of the area the woods are more mesic and less like oak savannah. There are fewer bur oaks, some large red oaks, more walnut, some basswoods and some Kentucky Coffee Tree. Throughout the area the understory is very open indicating a closed canopy above. *Eastern portion:* This portion is heavily grazed. Consequently it has a more open appearance. Like the western portion it has a number of large bur oaks and red oaks on the north facing slope near the stream. There are lesser amounts of bitternut hickory and walnut and a grove of Kentucky Coffee Tree. The open spaces

around these trees are filled with thorny, grazing-tolerant species such as raspberry (abundant), honeylocust, osage orange and hawthorn. A number of large red oaks and bur oaks have been cut down this season. Ring counts on these indicate they are 100-150 years old.

Restoration prospects: The western portion of this area appears to be in transition from oak savannah to mixed hardwoods. I would recommend letting this process continue. The eastern portion could be restored to savannah. Grazing in the far eastern section has limited the invasion of thorny trees and would make restoration easier. The central area is more overgrown. Recent logging in the eastern section reduces the quality of this area.

2) Medium quality woods. This area is in a fairly degraded condition. It was grazed at one time but hasn't been recently. Consequently the thorny species that invaded during grazing have taken over the open spaces making them fairly impenetrable. These thorny species include prickly ash as well as honeylocust and hawthorn. Wetter parts of the area have much black walnut and some Kentucky Coffee Tree.

Restoration prospects: The formerly grazed portions of this area could be restored. Areas where scrubby species have invaded may be best left alone.

3) High quality oak savannah. This area is currently being grazed. In appearance it is the best example of what an oak savannah might have looked like. There is some invasion by black locust on the edges.

Restoration prospects: Excellent. Grazed areas have the greatest potential for retaining original oak savannah species. With fire and some shrub and non-oak tree removal many of these species could come back.

4) High quality woods. This area consists of a large hill with a northwest-facing slope and a northeast-facing slope which goes down to Walnut Creek. The upland and northwest-facing portion of this area has many large bur oaks and some shagbark hickory. It has been invaded by a fair amount of honeylocust and hackberry but still has a fairly open understory. The northeast-facing slope has been more heavily invaded. The understory is very dense and impenetrable consisting of honeylocust, hawthorn, raspberry, cherry and some elm.

Restoration prospects: The northwest-facing slope and hilltop portion of this area could readily be restored and would be a fine example of oak savannah. There are many young bur oaks present which would provide for continued presence of this species over centuries. The northeast-facing slope has been much more heavily invaded. This would be a much more difficult area to restore.

Mature Hardwoods

5) Very high quality woods: This is the only example of mesic hardwoods on the Refuge. An indicator of this is the a large amount of basswood and the presence of 2 fern species in the understory. The canopy also includes some bur oaks, red oaks, bitternut hickory, shagbark hickory, black walnut as well as occasional large hackberry

and elm trees. The canopy cover is 100% and the understory is very open and brush free.

6) High quality mixed woods. This area consists of a north-facing slope along a stream bank. There is shagbark hickory, bur oak, red oak, American elm, basswood, and some Ohio buckeye; many of these trees are quite large.

7) High quality mixed woods: A stream runs through the area creating ravines. The trees are a mix of upland species, bur oak, red oak and shagbark hickory, and more mesic species, basswood, walnut, and in wetter areas some riparian species, cottonwood and willows. On the margins of the woods are scrub species such as cherry, elm, and hackberry. The canopy is mostly closed and the understory is fairly open; the eastern portion is being grazed.

8) Medium quality woods. A sizeable portion of it a very unique type of woods. It is ~~dominated by Ohio buckeye which forms a closed canopy. Ohio buckeye is normally not~~ a canopy species and is only a minor component of mixed woods. It is near the northern limit of its range at the Refuge. Other species found at this site are basswood, hackberry, shagbark hickory, bur oak and walnut. Some portions are being grazed. The canopy is generally closed. Some areas are being grazed.

9) High quality woods. On upland areas near the impoundment is more of an oak savannah, kept open by grazing. This grades into a more mesic woods consisting of more bur oak, basswood, shagbark hickory, walnut. The canopy is closed and the understory open (grazed). Towards the stream there is bitternut hickory, shagbark hickory, basswood, some bur oak and red oak.

10) High quality woods. The area is dominated by bur oak but it is more of a bur oak forest than a savannah. The canopy is closed and trees not spreading in their habit.

Description of prairie plants found

Site

PP-1 Wild Bergamot *Monarda fistulosa*
Culver's Root *Veronicastrum virginicum*
Partridge pea *Chamaecrista fasciculata*
Goldenrod *Solidago canadensis*

PP-2 Black-eyed Susan *Rudbeckia serotina*
Compass Plant *Silphium laciniatum*
Goldenrod *Solidago canadensis*
Bush Clover *Lespedeza capitata*

PP-3 Bush Clover *Lespedeza capitata*
Goldenrod *Solidago canadensis*

PP-4 Prairie False Indigo *Baptisia leucantha*